

INDOOR AIR QUALITY ASSESSMENT

**White Brook Middle School
200 Park Street
Easthampton, MA**



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
February 2019

BACKGROUND

Building:	White Brook Middle School (WBMS)
Address:	200 Park Street, Easthampton, MA
Assessment Requested by:	A parent
Reason for Request:	General indoor air quality (IAQ) concerns
Date of Assessment:	February 14, 2019
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Michael Feeney, Director, IAQ Program
Date of Building Construction:	1976
Building Description:	Single story, multi-wing facility
Building Population:	Approximately 450 students in grades 5 to 8 and 50 staff members
Windows:	Mostly openable

INTRODUCTION

The IAQ program has previously visited the WBMS in 2018. Wet carpeting was removed in a number of areas, including the library and hallways. Tennis balls were removed from chairs and peeling paint in the gymnasium was removed as recommended in the previous IAQ report. It was reportedly planned to have further carpeting removed from the library area. It is our understanding that the school was the subject of a successful vote for replacement in May 2018 (MassLive, 2018). In general, it will take several years for a new building to be constructed. Therefore the various recommendations in this report are geared towards improving/maintaining the conditions within the building to the extent possible while recognizing that the building will be replaced in the near future.

Under current Massachusetts School Building Authority (MSBA) regulations, the expected service life of a newly constructed or renovated school building is at least 50 years [963 CMR 2.03(b)]. Given that the WBMS is approximately 43 years old, it is expected that a number of building components have exceeded their expected service life, which will likely require increased maintenance or removal/replacement as needed until the building is replaced.

METHODS

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

RESULTS and DISCUSSION

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below the MDPH guideline of 800 parts per million (ppm) in the majority of areas surveyed, indicating adequate air exchange in most of the building. It is important to note that carbon dioxide levels would be expected to rise with increased occupancy. A few areas were slightly elevated and would benefit from introducing more fresh air to these rooms.
- ***Temperature*** was within the MDPH recommended range of 70°F to 78°F.
- ***Relative humidity*** was below the MDPH recommended range of 40 to 60%.
- ***Carbon monoxide*** levels were non-detectable in all areas tested.
- ***Fine particulate matter (PM_{2.5})*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 µg/m³ in all areas assessed.

To maximize air exchange, the BEH recommends that mechanical ventilation systems throughout the building (classrooms, gymnasium, etc.) operate *continuously* during periods of occupancy. Without the system operating as designed, normally occurring pollutants cannot be diluted or removed, allowing them to build up and lead to IAQ/comfort complaints.

Ventilation

It is important to note that the HVAC system dates from the 1970s. Controlling temperatures in a large building with variable occupancy is difficult, and more so because many of the HVAC and associated equipment is over 40 years old. Efficient function of equipment of this age is difficult to maintain, since compatible replacement parts are often unavailable. According to the American Society of Heating, Refrigeration and Air-Conditioning Engineering

(ASHRAE), the service life¹ for the various components of the HVAC system is between 20 to 30 years, assuming routine maintenance of the equipment (ASHRAE, 1991). Despite attempts to maintain the equipment, the optimal operational lifespan of this equipment has been exceeded.

Of note that the relative humidity readings ranged from 16 to 21 percent, which were below the MDPH recommended comfort range the day of the assessment. The MDPH recommends a comfort range of 40 to 60 percent for indoor air relative humidity. Relative humidity in the building would be expected to drop during the winter months due to heating. The sensation of dryness and irritation is common in a low relative humidity environment. “Extremely low (below 20%) relative humidity may be associated with eye irritation [and]...may affect the mucous membranes of individuals with bronchial constriction, rhinitis, or cold and influenza related symptoms” (Arundel et al., 1986). Low relative humidity is a common problem during the heating season in the northeast part of the United States.

Microbial/Moisture Concerns

As noted previously, wet carpet was removed in a number of areas. The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If not dried within this time frame, mold growth may occur. Once mold has colonized porous materials, they are difficult to clean and should be removed/discarded.

Carpeting

Wall to wall carpeting exists in classroom areas and the library. As noted, carpeting was removed in a number of areas. Carpeting remains in several of the pod areas. As noted in the previous report, carpeting in schools, if well maintained, is expected to have a service life of 7 to 11 years (IICRC, 2002; Bishop, 2002). Worn carpet can be a source of dust, debris and other pollutants that can become readily aerosolized when trod upon. This condition can be exacerbated by low humidity that will occur during the heating season. While previous reports

¹ The service life is the median time during which a particular system or component of ...[an HVAC]... system remains in its original service application and then is replaced. Replacement may occur for any reason, including, but not limited to, failure, general obsolescence, reduced reliability, excessive maintenance cost, and changed system requirements due to such influences as building characteristics or energy prices (ASHRAE, 1991).

noted elevated particulate matter, none were noted during this assessment indicating the likely source was removed.

Other Conditions

Dust control appears to be improved since the previous IAQ assessment.

Conclusions/Recommendations

The following recommendations are provided to improve IAQ for the duration of use of the building:

1. Monitor existing carpeting for material degradation (e.g., wear, unravelling, loss of adhesion to the floor). If present, remove carpet displaying material degradation. Routinely check carpeting after large rainfalls for damage from leakage and replace as necessary.
2. Make efforts to increase fresh air supply to areas showing slightly elevated carbon dioxide levels (Table 1).
3. Continue to operate supply and exhaust ventilation continuously in all areas during occupied periods.
4. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
5. During temperate weather, use windows/doors to supplement fresh air and increase cross-ventilation.
6. Ensure all HVAC equipment is maintained and supply vents are cleaned periodically to prevent dust re-aerosolization.

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

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IICRC. 2002. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: A Life-cycle Cost Analysis for Floor Coverings in School Facilities.

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US EPA. 2008. “Mold Remediation in Schools and Commercial Buildings”. Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. Available at: <https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide>.

Picture 1



Severely worn carpet

Picture 2



Exposed carpet seams

Picture 3



Rippled carpet

Picture 4



Faded carpet

Picture 5



Peeling wall paper from dividers

Location: White Brook Middle School

Address: 200 Park Street, Easthampton, MA

Indoor Air Results

Date: 2/14/2019

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background	288	ND	38	29	2					
403	690	ND	71	20	1	7	N	Y	Y	
404	691	ND	72	20	1	2	N	Y	Y	
Cafeteria	818	ND	73	20	1	22	N	Y	Y	
502	837	ND	73	16	2	26	N	Y	Y	Carpet
507	770	ND	72	18	1	0	N	Y	Y	
508	739	ND	72	18	1	1	N	Y	Y	
509	762	ND	72	18	1	1	N	Y	Y	
510	829	ND	73	19	1	21	N	Y	Y	
521	792	ND	72	19	1	0	N	Y	Y	Carpet
522	937	ND	71	21	3	21	N	Y	Y	Carpet
523	908	ND	70	20	3	3	N	Y	Y	Carpet

ppm = parts per million

µg/m³ = microgram per cubic meter

ND = non-detect

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferred
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

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Date: 2/14/2019

Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
524	792	ND	70	19	2	3	N	Y	Y	Carpet
525	780	ND	70	19	2	0	N	Y	Y	Carpet
531	652	ND	74	16	1	15	N	Y	Y	Carpet
532	573	ND	73	15	1	15	N	Y	Y	Carpet
533	556	ND	73	15	1	15	N	Y	Y	Carpet
535	539	ND	73	15	1	0	N	Y	Y	Carpet
536	509	ND	72	15	1	0	N	Y	Y	Carpet
600	406	ND	73	14	1	4	N	Y	Y	
605	417	ND	69	14	1	16	N	Y	Y	
610	423	ND	74	14	1	0	N	Y	Y	
611	492	ND	71	16	4	1	N	Y	Y	
620	346	ND	73	12	1	0	N	Y	Y	

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								Supply	Exhaust	
621	382	ND	72	13	1	1	N	Y	Y	Carpet
623	358	ND	73	14	1	2	N	Y	Y	
624	332	ND	72	13	1	0	N	Y	Y	Carpet
625	341	ND	74	13	2	2	N	Y	Y	
626	345	ND	73	13	1	0	N	Y	Y	
627	366	ND	74	13	2	3	N	Y	Y	
631	488	ND	71	13	3	1	N	Y	Y	Carpet
632	465	ND	71	15	1	0	N	Y	Y	Carpet
633	548	ND	72	16	2	0	N	Y	Y	Carpet
634	578	ND	72	16	2	1	N	Y	Y	Carpet
636	525	ND	72	15	2	3	N	Y	Y	Carpet
637	500	ND	72	15	2	4	N	Y	Y	Carpet

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								Supply	Exhaust	
638	589	ND	72	16	3	1	N	Y	Y	Carpet
642	641	ND	73	16	1	18	N	Y	Y	
Library	413	ND	70	15	1	13	N	Y	Y	Carpet
Band Room	328	ND	72	13	1	0	N	Y	Y	Carpet

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